publications of the leading twenty scientific men of Pennsylvania would secure a magnificent return in exchanges for its library.

—— We inform interested persons, that the NATURALIST does not publish long obituaries; also, that no obituary notices of scientific men of a length of a page or less, has ever been declined by its editors.

——:o:——

RECENT LITERATURE.

RYDER'S OBSERVATIONS ON EMBRYO FISHES.[1] — The Bulletin of the United States Fish Commission contains a series of articles upon various matters connected with the development of fishes, embodying the results of the investigations of Mr. J. A. Ryder during the year 1882.

The mode of absorption of the yolk of the embryo shad differs in the absence of a vitelline circulation from that which obtains in Tylosurus (Belone), Fundulus, Esox, and Salmo. The great mass of the yolk in the shad embryo consists of coarse, irregular masses of very clear protoplasmic matter, separated by a protoplasm which is optically different. The covering of the yolk is a palish amber-colored layer, quite different from the clear body of the yolk, and usually thicker at the end next the heart. The intestine lies in a longitudinal furrow on the dorsal aspect of the yolk-sac, and is never connected with it in this species. The yolk-sac is surrounded by a space filled with serous fluid. This space is capacious anteriorly, between the heart and the yolk, and this part is identified by Mr. Ryder with the segmentation cavity. The delicate pericardial membrane that separates this cavity from the pericardial space may, possibly, be perforate. In Tylosurus the two cavities are certainly connected. The heart opens freely into the segmentation cavity, and the appearance presented is that its persistent pulsation breaks up the yolk-substance into small spherules, sucks them out of the segmentation cavity, and carries them into the body of the embryo. The corpuscles develop on the surface of the outer yolk-layer, and after a while drop into the serous fluid, appearing like the white blood cells of human blood. As development proceeds, the yolk-sac becomes pointed in front, and the external layer becomes thicker, while the pericardial membrane becomes funnel-shaped to fit the anterior part of the yolk-mass. Before the final disappearance of the yolk, the liver of the young fish becomes more developed, and the portal vein makes its way over the dorsal aspect of the yolk towards the venous end of the heart. As the peculiar amber layer around the yolk persists to the last, it is probable that the central clear portion is transformed gradually into it.

[1] *Bulletin of the United States Fish Commission.*—Observations on the absorption of the yolk, the food, feeding, and development of embryo fishes, comprising some investigations conducted at the Central Hatchery, Armory Building, D.C., in 1882, pp. 179–205.

This is the history of the yolk-mass after the embryo is hatched, but as it grew in size before hatching, yolk absorption must have taken place before the heart was sufficiently developed to be an active agent in the process. This must be by *intussusception*, and in the amber yolk-covering it is undoubted that a process of cell and blood-cell differentiation takes place. Mr. Ryder concludes that the *hypoblast* of Gensch, said by that investigator to be the source from which the blood is derived, is the equivalent of the amber yolk-covering of the shad, and not the true hypoblast. This amber layer is a temporary structure, which disappears entirely, and does not enter into the formation of any organ or membrane. The serous cavity around the yolk in the shad represents the body cavity, and the outer covering of this, though only $\frac{1}{2000}$ of an inch in thickness, contains epiblast, mesoblast, and hypoblast.

There is practically little difference between the modes of yolk absorption in the chick and in the fish.

A second note refers to some extraordinary hybrids derived from the impregnation of the eggs of the shad with the milt of the striped bass. Many hatched, several lived till they lost their egg-sacs, and about fifty were placed alive in a carp pond. The preponderance of characters was toward the female parent, but the teeth were more numerous and the gape of the mouth wider.

The fungus or alga, that is so fatal to shad eggs, develops wherever there is any imperfection in the circulation of the water. Three forms of glass hatching vessels, the Chase, the Clark, and the McDonald jars, are so arranged that every egg can be kept in continuous gentle movement, while they can be kept free from dead eggs without a skim net. Experiments with carbolic acid, in the hope of eradicating this fungus from the surface of the bodies of some large gold-fish that had become infested with it (probably derived from dead shad-eggs) failed completely. Mr. Livingston Stone states, that a strong solution of salt will kill it, while Mr. Behler recommends a saturated solution of salt water, and states that, if young salmon infested with the fungus are dipped bodily into asphalt, the fungus will be killed, and the young fish come out all right, the asphalt gradually peeling off.

A fifth note relates to feeding young shad with Daphnidæ, which, when transferred from the carp-ponds to the aquarium, were observed to die rapidly. The lower temperature may have been a cause, but the principal reason was doubtless the lack of the protozoa, algæ, etc., which form the proper food of the minute crustacea.

Another note refers to methods of handling the adhesive ova of the white perch, and another to the proved destructiveness of sticklebacks to shad larvæ. Twenty-five of these were destroyed in half an hour by four *Apeltes quadricornis*. Both neuropterous

and coleopterous larvæ are also capable of destroying young shad. Transparency is no safeguard against any of these enemies.

Well worthy of the attention of all naturalists are the original observations and categorical facts brought together by Mr. Ryder to prove that there is between ova, even of allied genera, considerable difference, and that at no stage is there a positive identity.

The mechanical construction, as it may be termed, of ova affects the course of their development. The Teleost ovum has a relatively enormous yolk, which must be included by the blastoderm in order to be absorbed, and this relatively large yolk has much to do with the difference observed between its development and that of a Marsipobranch or Amphibian. The eggs of the Salmonidæ have an abundance of oil drops in the vitellus, especially just under the germinal disk. These, by their buoyancy, keep the disk constantly directed upward. The cusk, the crab-eater, Spanish mackerel and moon-fish have eggs which are buoyant from the possession of a single large oil-sphere situated almost exactly opposite to the germinal disk, and thus keeping it face downward—just the reverse of what occurs in the salmonoids. Even after hatching, the young are at first unable to right themselves on account of the presence of the oil-drop. The cod ovum has no oil-drop, yet floats with the germinal disk downwards. That of *Morone americana* (white perch) is adhesive and fixed, with a very large oil-sphere which keeps the disk on the lower side of the vitelline globe. The shad egg is non-adhesive, and heavier than water, and the germinal disk has a constant tendency to arrange itself at the side of the vitellus as viewed from above, though there is no oil to influence it. In Fundulus and Syngnathus the oil-drops appear uniformly distributed. The number of proto-vertebræ or primary somites differs so much that while Tylosurus has as many as seventy-five pairs, Alosa has only eighteen to twenty. Our author ventures this bold remark: "When our knowledge is more complete, we shall perhaps be able to distinguish the species apart by the eggs alone, just as botanists have used the characters presented by seeds to distinguish plants."

Not the least of the differences, he truly observes, is form, but we can scarcely follow him to the conlusion that, since "the *somewhat similar* germs of different animals produce *different* species, we shall or ought to hold to the doctrine that the protoplasm of which a man is made is different from that of which the body of a dog or fish is composed."

Somewhat similar bricks may be formed into widely different buildings, but it does not follow that the clay differs. The same kind of clay may enter into the grandest erection and the meanest, while two very similar buildings may be made of different clay. Something the same, we conceive, occurs with protoplasm.

Its chemical constitution may differ, but the difference of animal species is mainly morphological, and there is no reason why different protoplasm may not occur in similar species, while species differing widely morphologically may be formed of similar protoplasm.—*W. N. L.*

WHITE'S GEOLOGY OF THE SUSQUEHANNA RIVER REGION.[1]—While such a report as this is necessarily filled with details, Professor White has elicited some results (epitomized in the prefatory letter of Professor Lesley) especially bearing on palæontology and glacial geology, which are of general interest. Professor White finds fossiliferous beds high in the Catskill formation, some of the fossils of which appear to be of Chemung type. The discussion of this point is a most interesting one.

The geology of the great terminal moraine, the general course of which is outlined in the prefatory letter of the director of the survey, is discussed. As the ice-sheet, he says, covered the whole country, the high mountain plateaus and the low valleys alike, the moraine is in some places 2000 feet above ocean level, as in the North mountain; in others only 500 feet, as at Berwick. Professor White's observations on the floods of ice-water and the formation of the terrace-plain of part of Columbia county are of much interest.

The limits of the glacial drift in the counties surveyed, are carefully given. "Glacial drift, as a sheet of unstratified sand, gravel and boulders, covers the whole region back of the moraine, and is finally exposed along water-courses. The thickness of this universal mantle of ice-borne trash, brought from the north, is about fifty feet; but where it is banked into the original hollows of the country, filling up ancient river valleys, it is much deeper. * * * Independent observers in other States have assumed fifty feet as about a fair general average thickness for the northern drift over the whole region back of the moraine. If this average be finally accepted, it must set at rest the vexed question of the eroding power of the ice-sheet; for fifty feet of eroded trash carried forward by the ice-sheet can only represent fifty feet (or somewhat less) of mother rock in place. This is an insignficant proportion of the amount of strata (from the coal measures down to the crystalline series) which has been removed from the crust of the earth in the long process of sculpturing the valleys and plains of Pennsylvania and New York, the Great Lake basins and the plain of Canada. Were the average thickness of the drift twice fifty feet, it would be equally true that the erosive power of the ice-sheet has been immensely overrated, and that

[1] *Second Geological Survey of Pennsylvania; Report of Progress G*[1]. *The Geology of the Susquehanna River region in the six counties of Wyoming, Lackawanna, Luzerne, Columbia, Montour and Northumberland.* By I. C. WHITE. With a colored geological map in two sheets, and thirty-one page plates in the text. Harrisburg, 1883. 8vo, pp. 464.